PCT/AU99/00135

09/623542

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APPLICANT: **FORRESS PTY LTD**

NUMBER:

FILING DATE: **05 MARCH 1998**

AUSTRALIA

PATENTS ACT 1990

PROVISIONAL SPECIFICATION

FOR THE INVENTION ENTITLED:

"SCREENING APPARATUS"

The invention is described in the following statement:

SCREENING APPARATUS

This invention is for a screening apparatus particularly suited for screening particulate material, although it may also be used for crushing, mixing or blending particulate material.

It is often necessary to screen particulate material in order to sort it in accordance with particle size. For example when mixing concrete or when building roads, it is necessary to screen gravel in order to sort into piles of different mean gravel size. Conventional screening apparatuses use screens and rotating or vibrating beds to select given particle size output. All particles which are of size equal or smaller to the selected size fall through the screen while the particles of larger size are held on the screen for later removal. One notable disadvantage with the rotating or vibrating bed type screening apparatuses is that they have a tendency to become clogged.

It is an object of the present invention to provide an alternate form of screening apparatus which attempts to alleviate the problems in the above described prior art.

According to the present invention there is provided a screening apparatus for screening a particulate material composed of particles of different size, said apparatus including:

a screen frame having an open bottom through which screened particles can pass;

a plurality of banks of blades supported on the screen frame; each bank having a plurality of evenly spaced blades arranged in a row and rotatable about a respective axis, the axes being parallel to each other, the blades configured to allow intermeshing of the blades of adjacent banks and wherein at least one bank of blades is linearly slidable along its axis of

rotation to provide a predetermined amount of axial freeplay and where a sizing gap is formed between each blade of one bank and the mutually adjacent blades of an adjacent bank;

wherein, when the blades are rotated and a particulate material is placed on the blades, the rotating blades agitate and/or crush the material to allow particles of a size equal to or smaller than the sizing gap to pass between the blades and through the open bottom.

Preferably adjacent banks of blades are axially offset relative to each other so that the blades of one bank alternate with the blades of an adjacent bank.

Preferably the blades are juxtaposed so that the blades on one bank extend transversely between an overlap with the adjacent blades of an adjacent bank.

Preferably said at least one bank of blades is formed on a sleeve which is slidably mounted on a drive axle, said drive axle rotatably mounted on the screen frame and concentric with the axis of rotation of said at least one of the bank of blades.

An embodiment of the present invention will now be described by way of example only with reference to the accompanying drawings in which:

Figure 1 is a plan view of an embodiment of the screening apparatus in accordance with this invention;

Figure 2 is a side view of the screening apparatus;

Figure 3 is a rear view of the screening apparatus; and,

Figure 4 is a view along section AA of the screening apparatus shown in Figure 1.

Referring to the accompanying drawings, a screening apparatus 10 for screening a particulate material composed of particles of different size (not shown) includes a screen frame 12 having an open bottom 14 through which screened particles can pass and a plurality of banks of blades 16A-16E (hereinafter referred to generally as "banks of blades 16") supported on the frame 12. In this embodiment, the frame 12 is of a form similar to the bucket or scoop found on a bobcat or front end loader but with a bottom section removed to provide the open bottom 14.

Each bank of blades 16 is rotatable about a respective axis of rotation 18A-18E (referred to hereinafter in general as "axes 18"). The axes 18 run parallel to each other although, as most clearly seen in Figures 2 and 4, axes 18A and 18E are located in a higher plane than axes 18B-18D.

Blades 20 of each bank 16 are evenly spaced and arranged in a single row coincident with their respective axes of rotation 18. For ease of description, the blades for the banks 16A-16E are designated as blades 20A-20E respectively. As seen most clearly in Figure 4, the blades 20A are configured to allow intermeshing of the blades 20 of adjacent banks 16. In this embodiment, each blade 20 is generally square in shape and has an arcuate scallop 22 formed midway between adjacent corners in each side of the blade 20. This leaves the blades with diagonally extending fingers 24 which can ride in or pass through the scallop 22 of an adjacent blade 20 during a portion of the rotation of the blade 20.

At least one of the banks of blades 16 and indeed preferably all of the banks of blade 16 are able to slide linearly along their respective axes of rotation 18 to

provide a predetermined amount of axial freeplay.

A sizing gap G is formed between a blade 20 of one bank 16 and adjacent blades 20 on an adjacent bank 16. With reference to Figure 1, a sizing gap G is formed between the blade 20D2 of bank 16D and blades 20E2 and 20E3 of bank 16E. The sizing gap determines the size of particles that can pass through the apparatus 10. As is apparent from Figure 1, the sizing gap G, may be different between different adjacent pairs of banks 16, (compare gaps G1 with gap G2).

When in use, drive is provided to the banks 16 causing them to rotate and a pile of particulate material is placed on the blades 20. The rotating blades agitate and/or crush the particulate material to allow particles of a size equal to or smaller than the sizing gap to pass between the blades 20 through the open bottom 14. It will be appreciated that as the blades 20 rotate they may also act to crush or break particles to a size so as to fit through the sizing gap.

As is apparent from Figure 1, the blades 20 of adjacent banks 16 are staggered so that the blades of one bank alternate with the blades of an adjacent bank looking i the axial direction. Thus, referring to Figure 1, the blades 20A of bank 16A alternate with the blades 20B of bank 16B. Also the blades 20 of at least some of the banks 16 overlap each other, see for example blades 20A which overlap with (ie extend transversely between) adjacent blades 20B. However, the degree of overlap is not necessarily uniform between adjacent banks. For example in this embodiment, between banks 16B, 16C and 16D the degree of overlap of adjacent blades on adjacent banks is much less than the overlap between banks 16A and 16B; and, banks 16D and 16E.

As shown in Figure 4, a row of plates 26 is provided along the inside on each a side of the frame 12. Each plate 26 is disposed between adjacent blades 20A/20E on banks 16A/16E respectively. The plates 26 effectively act to block gaps between the banks 16A and 16E and the adjacent sides of the frame 12.

The axial freeplay of the banks 16 is provided by forming the blades 20 on respective sleeves 28 which in turn are slidably mounted on respective rotatable axles 30. In order to allow for a transfer of torque between the axle 30 and its respective sleeve 28, both are formed with a non circular (in this instance square) cross section. Although, in alternate embodiments, these sections can be circular and keys or other arrangements provided in order to allow the transfer of torque from the axle 30 to its sleeve 28. The degree of axial freeplay of each sleeve 28 is limited by conventional means such as of stops and flanges. The freeplay can be limited to ensure that a bank 16 cannot slide axially more than one half the distance between adjacent blades 20.

Drive is imparted to the bank 16 via hydraulic motors 32A and 32B which are attached to the frame 12. The hydraulic motors 32A, 32B may receive hydraulic fluid from a further hydraulic motor which typically would be part of a larger machine or device to which the apparatus 10 is connected. The hydraulic motors 32A, 32B have respective pulley wheels 34A, 34B to allow a transfer of torque to the banks 16. The axle 30 for each bank of blades 16 is also provided with a respective pulley wheel 38A-38E. A pulley chain or belt 36A couples pulley wheels 34A and 38A; chain/belt 36B couples pulley wheels 38A and 38B; chain/belt 36C couples pulley 38B and 38C; chain/belt 36D couples pulley 38C and 38D; chain/belt 36E couples pulley 38D and 38E; and chain/belt 36F couples pulley wheels 38E and 34B. By virtue of this arrangement, each of the pulley wheels 38

and thus each of the banks of blades 16 are rotated in the same direction. A series of idler rollers 40 is provided for applying tension to the chain/belts 36B, 36C, 36D and 36E.

When the frame 12 of apparatus 10 is connected to say a bobcat or front end loader, the bobcat or front end loader can be used to manipulate the frame 12 to scoop up a supply of particulate material which is supported on the blades 20, and then the hydraulic motors 32 activated to cause rotation of the blades 20. As the blades rotate they agitate the particulate material and allow particles of a size smaller than the sizing gap G to pass between the banks of blades 16 and through the open bottom 14. The blades 20 may also act to crush or break the particulate material down to a size which will pass through the sizing gap. Material which is of a size larger than the sizing gap and is not crushed or otherwise broken (hereinafter referred to as "oversized particles") remain on top of the blades 20. Eventually, the amount of oversized particles supported on the blades 20 reaches a stage where it prohibits the screening of any further particulate material. At this time, the oversized material is simply dumped from the frame 12 at a suitable location.

The freeplay in the banks of blades 16 which allows axial movement has been found to assist in preventing clogging of the apparatus 10.

Now that an embodiment of the apparatus 10 has been described in detail it will be apparent to those skilled in the relevant arts and numerous modifications and variations may be made without departing from the basic inventive concepts. For example, the present embodiment illustrates the use of five banks 16 of blades. However, the number of banks can be varied to suit the application at hand. Also, the outer most banks 16A and 16E as shown as being raised

above the remaining banks to form a cradle like structure or shape of banks 16. However this is not necessary; in other configurations all the banks 16 can be in the same plane, or arranged in an alternating "up and down" configuration. Further, the degree of freeplay in the banks 16 can be made adjustable to allow adjustment of the freeplay for different applications. This can be provided for by simple known mechanical devices such as threaded collars, lock nuts and shims etc which can be moved axially along the axle 30 and then locked in place. Also, while the frame 12 in this embodiment is in the form of a bucket or scoop from a bobcat or front end loader, it can take any other suitable form such as a simple rectangular or square box like structure having an open top and an open bottom. Any type of particulate material can be screened, crushed, mixed or blended with this apparatus such as for example gravel, sand, soil, aggregates, humus etc. Also, while the banks 16 are described as being rotated in the same direction, they can be arranged to rotate in different directions by use of conventional gearing. All such modifications and variations together with others which would be obvious to a person of ordinary skill in the art are deemed to be within the scope of the present invention the nature of which is to be determined from the aforegoing description.

Dated this 05th day of March 1998

FORRESS PTY LTD
By Their Attorneys

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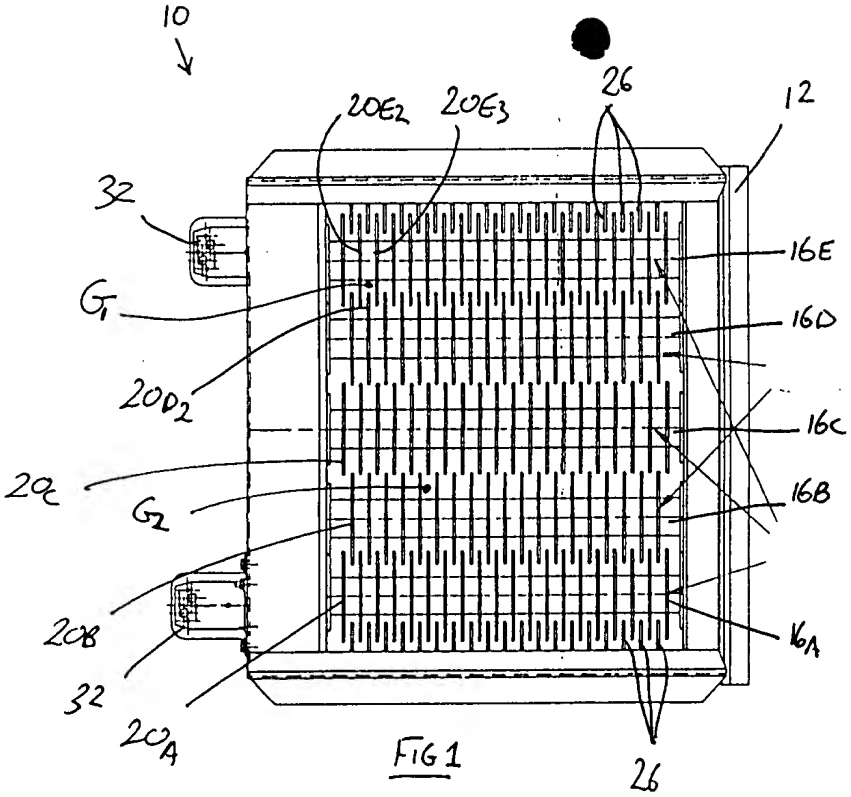

FIG 1

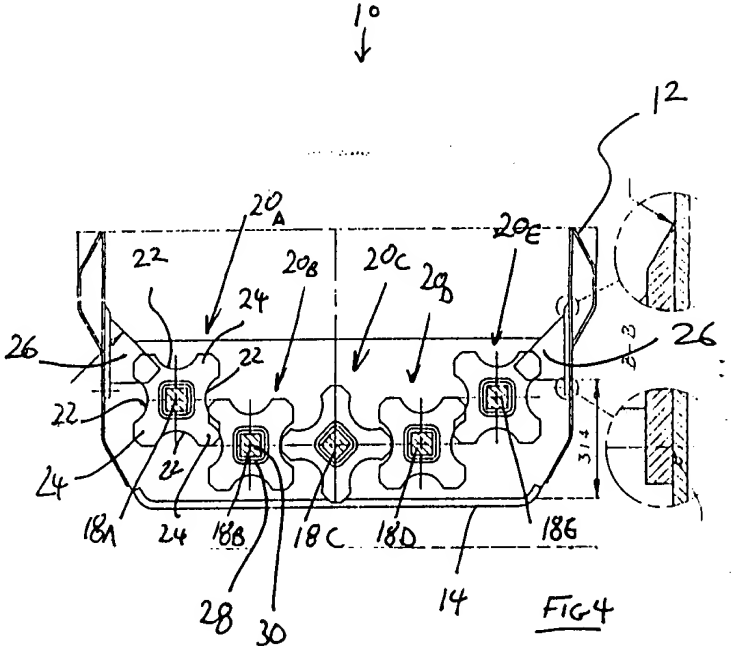

FIG 4

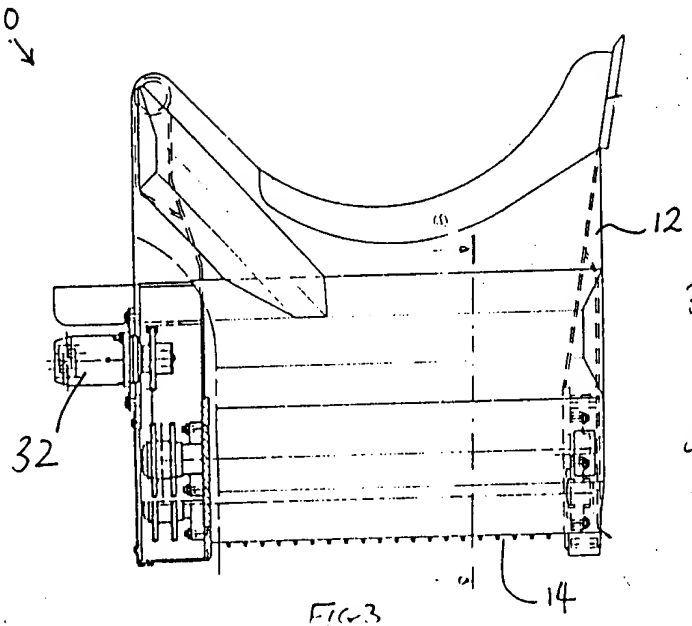

FIG 3

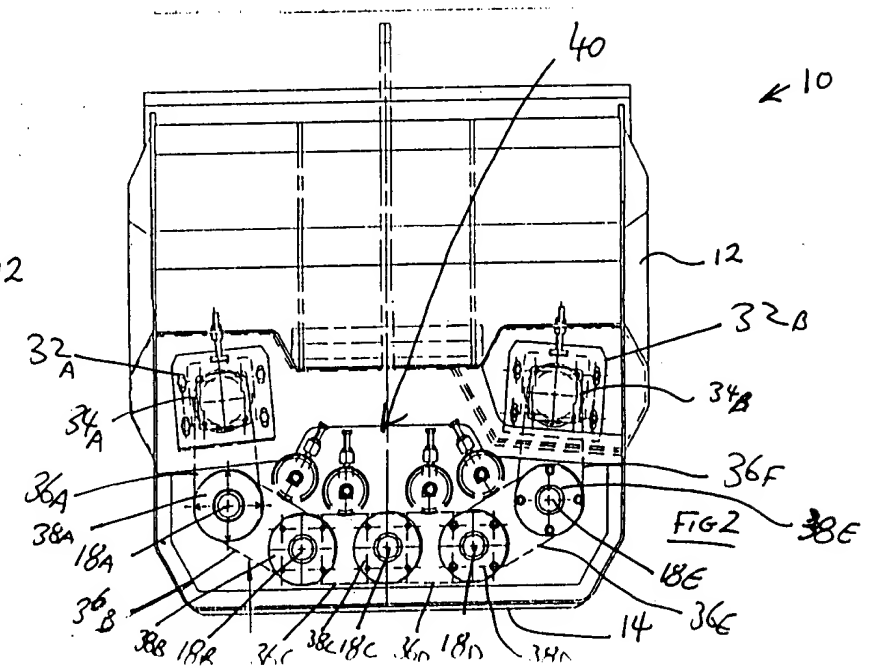

FIG 2